

Pupae of Japanese Zygaenidae and Epipyropidae (Lepidoptera)*

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Abstract Pupae of 13 genera of Zygaenidae and two genera of Epipyropidae from Japan are described and classified.

Key words Pupa, classification, Zygaenidae, Epipyropidae, Japan.

Zygaenid pupae from Japan were described in three genera by Nagano (1916) for the first time and the present author (1965) has reported only a preliminary classificatory key of seven genera of Japanese zygaenid pupae. Following that pupae of some genera were described by Nakamura (1978, 1993), Nishihara (1992) and Yen and Yang (1997). The author revises his previous key and describes the pupae of 13 genera with illustrations. In addition, pupae of two genera of Epipyropidae are described in this paper.

Zygaenidae

General characters of zygaenid pupa

Pupae of this family are incomplete and adecticous. They are feeble, fusiform, freely movable in 3rd–7th (♂) or 3rd–6th (♀) abdominal segments and with loosely fused appendages of head and thorax. The following description applies.

Head more or less protruded, with adfrontal and coronal sutures; labial palpus absent except for Phaudinae; mandible scarcely visible; caudal end of suture restricting eye-piece touching maxillar; suture between glazed and sculptured eye-pieces indistinguishable; maxilla long and slender, extending well cephalo-laterally to antenna but short and expanding fanwise in *Pryeria* (this feature is apparently plesiomorphic); antenna almost reaching caudal margin of wing, broad in the genera of Chalcosiinae; suture between pro- and mesothorax attaching to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle concealing or appearing on the ventro-lateral prolongation of maxilla, protruded frequently; hindwing hidden under forewing on 2nd abdominal segment in Phaudinae, on 3rd segment in Procridinae and in Zygaeninae and on 4th segment in Chalcosiinae excepting *Pidorus* and *Elcysma*; prothoracic legs frequently meeting on meson in distal portion, femur appearing large except for *Elcysma*, but very small in *Pryeria*, sternum widely visible between tibiae on ventro-meson in *Pryeria*; metathoracic leg extending to 5th to 7th abdominal segment but to 4th segment in *Pryeria*; length of metathoracic leg of ♂ longer than that of ♀ in many genera; 2nd–10th abdominal segments dorsad with one or two transverse rows of micro spines in Phaudinae, Procridinae and Zygaeninae but transverse band of micro spines in Chalcosiinae; abdominal spiracle appearing on 1st–8th segments, 8th one vestigial but 7th and 8th spiracles vestigial in the species of *Balataea* (*Balataea*); cremaster absent, with one pair of fleshy spinules (adminicula) in Phaudinae and many pairs of setae in Procridinae.

*Taxonomic studies on the pupae of Japanese Lepidoptera-Heterocera I

Pupating in a white or pale brownish grey, secure parchment cymbiform cocoon constructed on the leaf of host plant. *Clelea esakii* Inoue cocooned in the group (Hayashi, 2003).

European observers have recorded that the pupa of *Zygaena* pronounces a sound similar to that of a grasshopper (Tremewan, 1985) but this habit has not been recorded in Japanese species.

Key to the genera

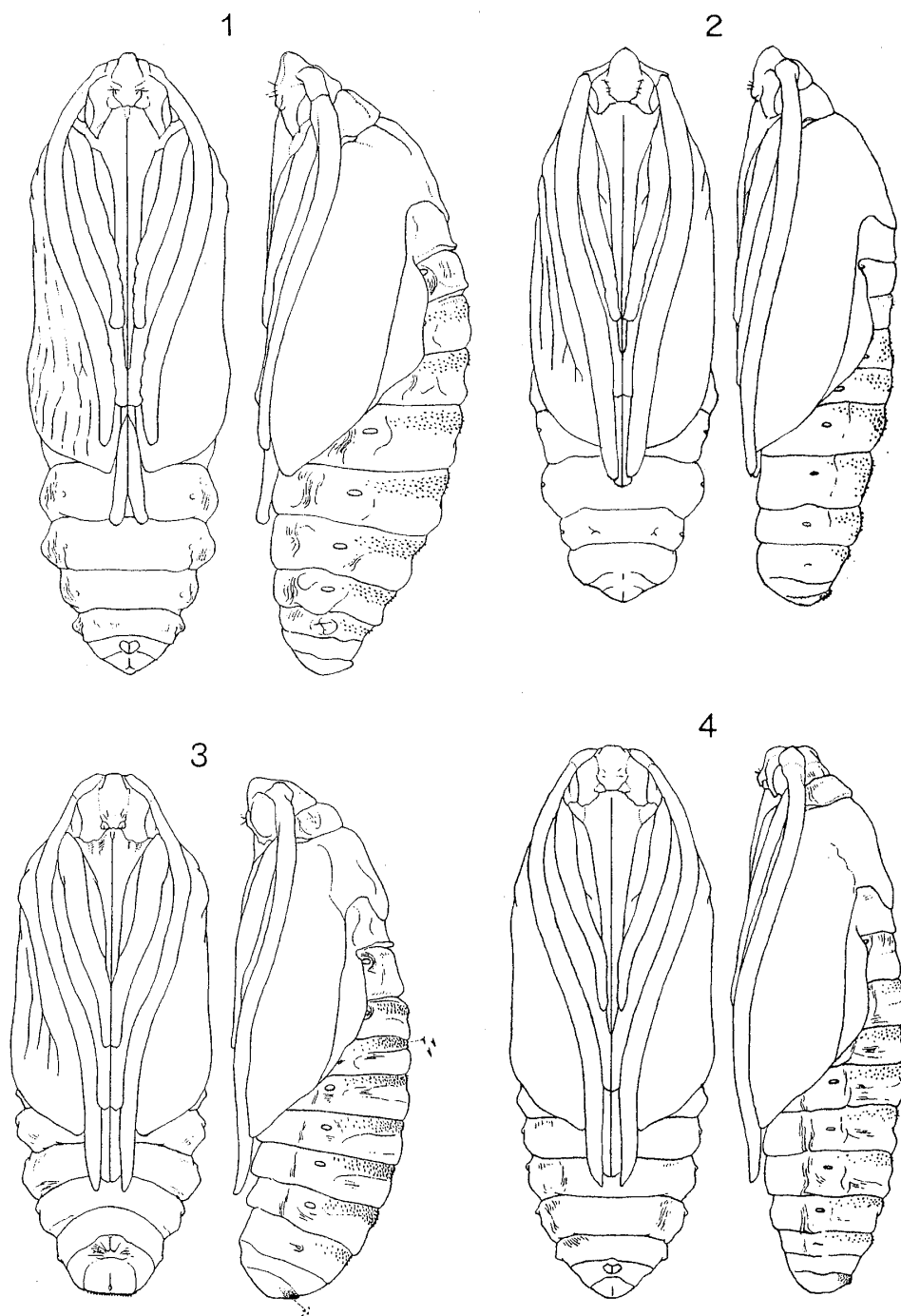
1. C11 and C12 setae present; labial palpus present, relatively large; maxillae short, expanded fanwise left and right, never meeting on meson and mentum visible between them; prothoracic femur appearing very small; 1st–8th abdominal spiracles completely visible **Phaudinae**: *Pryeria* Leech
- Labial palpus absent; maxilla long; prothoracic femur appearing large; 1st–2nd abdominal spiracles half visible or invisible 2
2. Sexual dimorphism not so remarkable; cremaster setae absent 3
- Sexual dimorphism remarkable; C11 and C12 setae present; cremaster setae present **Procridinae**: 9
3. 2nd abdominal segment not bearing many micro spines at cephalic margin; 1st abdominal spiracle absent and 3rd spiracle visible **Zygaeninae**: *Zygaena* Fabricius
- 2nd abdominal segment bearing many micro spines at cephalic margin; 1st abdominal spiracle visible, or if invisible then 3rd spiracle invisible **Chalcosiinae**: 4
4. Longitudinal fusiform. Inner margin of hindwing appearing large; prothoracic spiracle situated at normal position 5
- Prolonged. F1 seta present; inner margin of hindwing appearing slender or invisible; prothoracic spiracle situated in cephalo-lateral prolongation of maxilla 8
5. F1, C11 and C12 setae present; frons protruded; cephalo-lateral prolongation of maxilla extending to antenna; antenna never reaching tip of metathoracic leg 6
- C11 and C12 setae present; frons never protruded; cephalo-lateral prolongation of maxilla never extending to antenna; antenna reaching just beyond tip of metathoracic leg 7
6. Antenna extending before caudal margin of wing; hindwings hidden under forewing at cephalic margin of 4th abdominal segment and meeting on meson in short distance between meso- and metathoracic legs; 2nd–8th abdominal segments scattered dorsad with micro spines *Erasmia* Hope
- Antenna extending beyond caudal margin of wing; hindwing hidden under forewing at caudal margin of 4th abdominal segment and never meeting on meson between meso- and metathoracic legs; 3rd–8th and 11th abdominal segments scattered dorsad with micro spines *Eterusia* Hope
7. Maxilla ending far before tip of prothoracic leg; antenna reaching 7th abdominal segment; hindwing hidden under forewing on 4th abdominal segment; caudal end of body more or less flattened *Neochalcusia* Yen and Yang
- Maxilla ending slightly beyond tip of prothoracic leg; antenna reaching 6th abdominal segment; hindwing hidden under forewing on 3rd abdominal segment; caudal end of body rounded *Pidorus* Walker
8. Maxilla ending far beyond tip of prothoracic leg; antenna extending beyond caudal margin of wing; metathoracic leg appearing short; 1st–3rd abdominal spiracles concealed; 9th abdominal segment scattered dorsad with a micro spine band; 10th segment without a series of aciculae *Histia* Hübner
- Maxilla ending far beyond tip of prothoracic leg; antenna extending far beyond caudal margin of wing; metathoracic leg appearing long; 1st–3rd abdominal

- spiracles visible; 9th abdominal segment dorsad never scattered with a micro spine band; 10th segment with a series of aciculae *Elcysma* Butler
9. Cephalo-lateral prolongation of maxilla never extending to antenna; caudal end of suture restricting eye-piece touching maxilla; forewing expanded to 6th abdominal segment; hindwing exposed more narrowly along forewing to caudal portion; prothoracic spiracle visible **unnamed tribe**: 10
- Cephalo-lateral prolongation of maxilla extending to antenna; caudal end of suture restricting eye-piece touching antenna; forewing expanded to 4th or 5th abdominal segment; hindwing hidden under forewing on 2nd or 3rd abdominal segment 11
10. Abdominal segment bearing many micro spines at cephalic and caudal margins; 1st abdominal spiracle invisible; abdominal spiracle elliptical; 7th and 8th abdominal spiracles rudimentary; cremaster seta hooked *Pseudoinope* Efetov and Tarmann
- Abdominal segment bearing many micro spines at cephalic margin; 1st abdominal spiracle visible; abdominal spiracle circular, 8th spiracle rudimentary; cremaster seta ciliary *Rhagades* Wallengren
11. Abdomen slightly puffy; maxilla not reaching tip of antenna, if beyond it, then longer than metathoracic leg; prothoracic spiracle visible; 8th abdominal spiracle situated dorsad of those of the other segments; 2nd–9th abdominal segments with a series of micro spines dorsad **Procridini**: *Illiberis* Walker
- Abdomen slim; maxilla reaching or extending beyond tip of antenna; prothoracic spiracle invisible; 8th abdominal spiracle situated at normal position; 2nd–8th abdominal segments with a series of micro spines dorsad **Artonini**: 12
12. Metathoracic leg of ♂ reaching 7th abdominal segment; hindwing hidden under forewing on 2nd abdominal segment; 2nd abdominal spiracle concealed *Balataea* Walker
- Metathoracic leg of ♂ reaching 5th abdominal segment; hindwing hidden under forewing at caudal margin of 3rd abdominal segment; 2nd abdominal spiracle visible *Clelea* Walker

Phylogenetic relationship (Fig. 24)

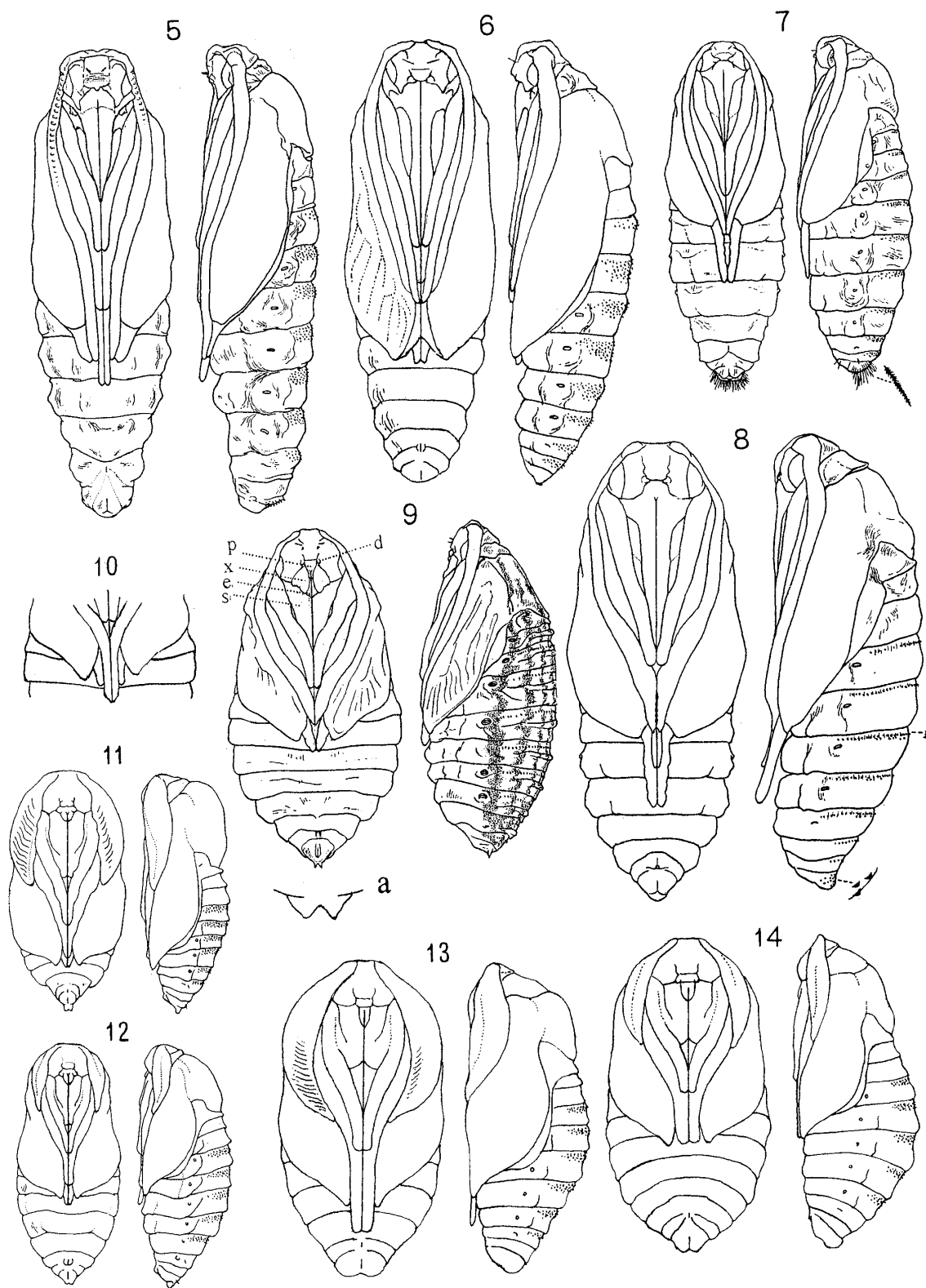
The Zygaenidae are currently divided into five subfamilies, Phaudinae, Procridinae, Callizygaeninae, Zygaeninae and Chalcosiinae (Epstein *et al.*, 1998). Four of them excluding the Callizygaeninae inhabit Japan and the pupae of these four subfamilies were examined in this paper. From the pupal characters, current subfamilial division was supported. The pupa of Phaudinae is the most primitive and singular, and distinctly different from other subfamilies in the presence of the labial palpus and expanded maxilla, etc. The pupa of Zygaeninae is related to that of the Chalcosiinae rather than that of the Procridinae in the absence of cremaster seta. The treatment of Chalcosiinae and Zygaeninae was also supported in the Japanese species, *viz.* the former shows fully the first abdominal spiracle and the second abdominal segment bears many micro spines at the cephalic margin while the latter does not have such characters.

The Procridinae is subdivided into two tribes, Procridini and Artonini, by Efetov and Tarmann (1995) but this tribal division seems to contain some insecure factors from the pupal view point: (1) *Clelea* which was tentatively placed in the Procridini in their paper is transferred to the Artonini on the basis that in this genus the maxilla reaches the tip of the antenna, etc. (2) *Rhagades* which was included in the Procridini by Efetov and Tarmann (1995) is here separated and placed in an unnamed tribe together with *Pseudoinope* on the



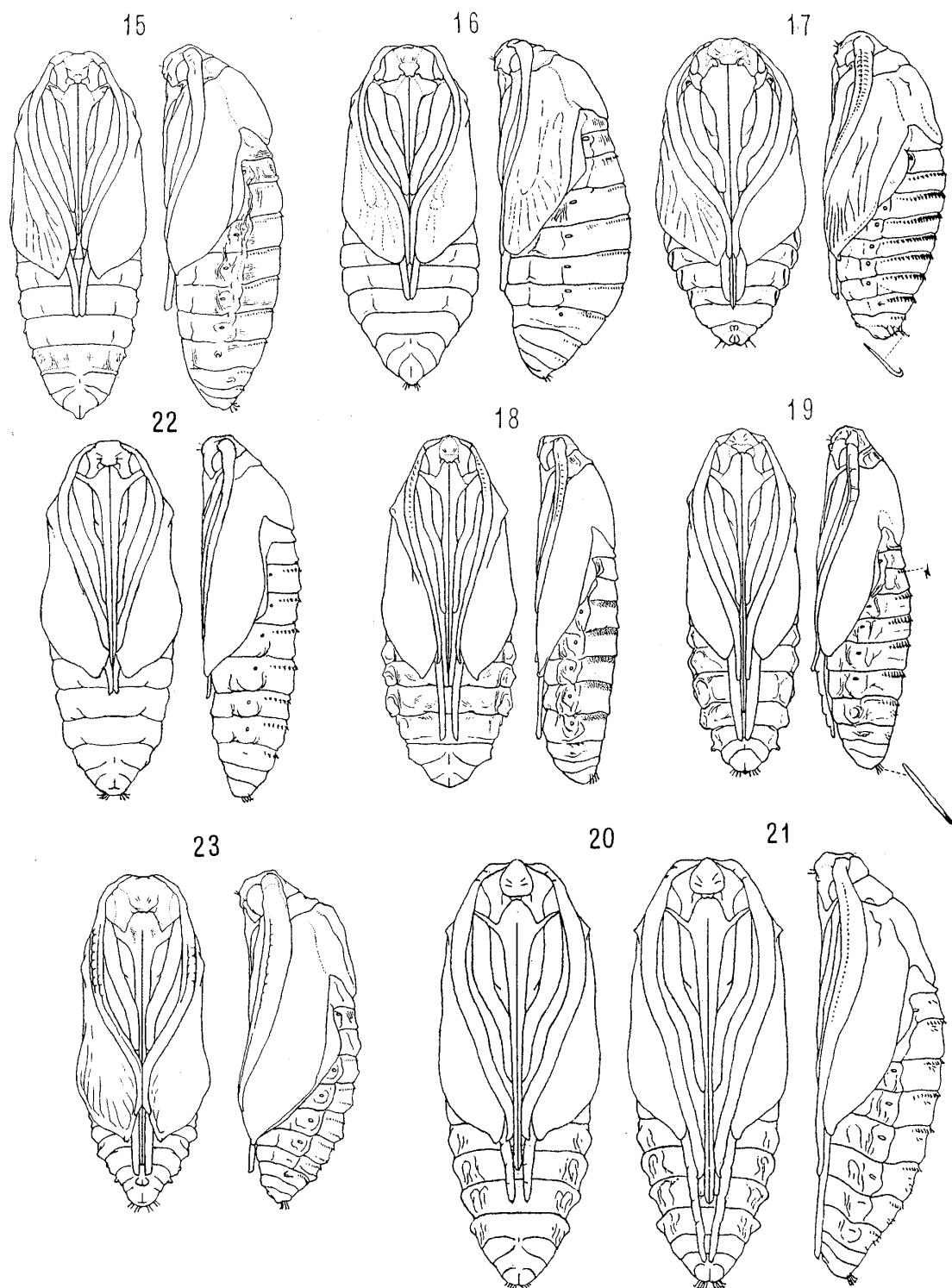
Figs 1-4. Pupae of Zygaenidae. 1. *Erasmia pulchella* Hope. 2. *Eterusia aedea* (Clerck). 3. *Neochalcusia remota* (Walker). 4. *Pidorus glaucopis* (Drury).

basis of the common feature of the prolongation of the maxilla touching the prothoracic leg. *Pseudoinope* was also included (as *Clelea*) provisionally in the Procradini in Efetov and Tarmann (1995). These two genera, however, differ considerably from other Procradini genera, so that their placement cannot be determined accurately at this time.



Figs 5–10. Pupae of Zygaenidae. 5. *Elcysma westwoodii* (Snellen & Vollenhoven). 6. *Histia flabellicornis* (Fabricius). 7. *Rhagades pruni* ([Schiffermüller & Denis]). 8. *Zygaena nippona* Butler. 9. *Pryeria sinica* Moore, ♀. a: cremaster (d: mandible, e: mentum, p: labial palpus, s: sternum, x: maxilla). 10. *Do*, ♂, showing position of apical portion of antenna.

Figs 11–14. Pupae of Epipyropidae. 11. *Epiricania hageromo* Kato, ♂. 12. *Do*, ♀. 13. *Epipomponia nawai* Dyar, ♂. 14. *Do*, ♀.



Figs 15-23. Pupae of Zygaenidae. 15. *Illiberis pruni* Dyar. 16. *I. rotundata* Jordan. 17. *I. tenuis* (Butler). 18. *Balataea martini* (Efetov). 19. *B. gracilis* (Walker). 20. *B. octomaculata* (Bremer), ♀. 21. *Do*, ♂. 22. *Clelea esakii* Inoue. 23. *Pseudoinope fusca* (Leech).

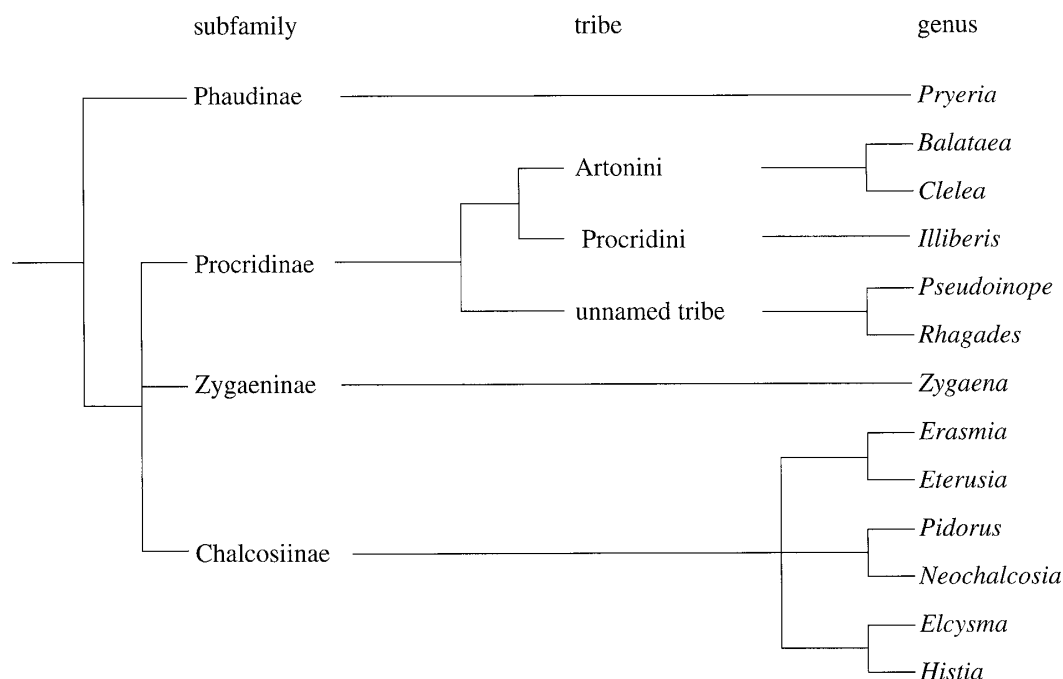


Fig. 24. A phylogenetic tree supposed from pupal characters.

Descriptions of the genera

Subfamily Phaudinae

Pryeria Leech (Figs 9, 10)

Sexual dimorphism remarkable. Rugby-ball shaped. F and Cl setae absent. Labial palpus relatively large with short slit at extremity; maxillae short, expanded fanwise, never meeting on meson and mentum appearing narrowly between them; mandible minute; antennae not quite reaching to caudal margin of wing in ♂ but slightly beyond in ♀, meeting on meson in distal portion; prothorax small; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of prothoracic leg; prothoracic spiracle invisible; prothoracic legs reaching three quarters of length to caudal margin of wing, meeting on meson in distal half, femur minutely recognisable, sternum appearing as large trigonal part on ventro-meson; distal half of mesothoracic leg hidden under antenna; metathoracic leg appearing large; hindwing hidden under forewing at caudal margin of 2nd abdominal segment; 1st abdominal spiracle visible; 8th spiracle rudimentary; 2nd–9th abdominal segments possessing a series of micro spines dorsad; cremaster consisting of a pair of small spinous processes.

Species examined. *P. sinica* Moore, 1877. Dark yellow with a dorsal, two subdorsal and a lateral light blackish bands. 11 mm.

Subfamily Zygaeninae

Zygaena Fabricius (Fig. 8)

Fusiform. F1 seta present. Labial palpus concealed; maxilla reaching beyond caudal margin of wing as far as 5th abdominal segment, intermediate portion hidden under antenna, proximal part extended laterally but prolongation never extending to antenna; antenna not quite

reaching caudal margin of wing, distal half broad; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle invisible; prothoracic legs ending at five-sevenths the distance to caudal margin of wing, meeting on meson at tip; mesothoracic leg reaching to slightly short of caudal margin of wing but distal half hidden under antenna; metathoracic leg large, extending to 6th abdominal segment; hindwing hidden under forewing at spiracular level of 3rd abdominal segment; 1st and 2nd abdominal spiracles concealed, 8th spiracle rudimentary; 3rd–9th abdominal segments with a series of micro spines positioned cephalo-dorsally; 10th segment with many sparsely scattered micro verrucae cephalo-dorsally; cremaster and cremaster setae absent.

Species examined. *Z. niphona* Butler, 1877. Yellowish white, 13 mm.

Subfamily Chalcosiinae

Erasmia Hope (Fig. 1)

Longitudinal fusiform. F1, Cl1 and Cl2 setae present. Front protruded. Labial palpus concealed; mandible distinct, maxilla extending to eight-elevenths of the length to the caudal margin of wing, proximal part never extending laterally; antenna extending to slightly short of caudal margin of wing; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle situated in normal position, prospiracular slit a large opening; prothoracic leg extending to three-fifths of the length of caudal margin of wing, femur appearing large; mesothoracic legs extending to slightly before tip of antenna, meeting on meson at distal portion; metathoracic leg extending to caudal margin of 5th abdominal segment; hindwing hidden under forewing at cephalic margin of 4th abdominal segment but appearing small between meso- and metathoracic legs; 1st abdominal spiracle half visible, 2nd–3rd spiracles invisible, 8th spiracle vestigial; 2nd–8th abdominal segments with band of micro spines cephalo-dorsally; cremaster and cremaster seta absent.

Species examined. *E. pulchella* Hope, 1841. Light brown, 25 mm.

Eterusia Hope (Fig. 2)

Longitudinal fusiform. Closely allied to *Erasmia* and only differing as follows: antenna extending to 6th abdominal segment and ending just before tip of metathoracic leg; hindwing hidden under forewing at caudal margin of 3rd abdominal segment and never visible cephalad; 1st, 3rd and 4th abdominal spiracles half visible, 2nd spiracle invisible; 3rd–8th and 11th abdominal segments scattered with micro spines dorsally.

Species examined. *E. aedea* (Clerck, 1763). Light brown, 22 mm.

Pidorus Walker (Fig. 4)

Longitudinal fusiform. CL1 and CL2 setae present. Labial palpus concealed; mandible slightly protruded; maxilla extending to two-thirds of length to caudal margin of wing, proximal part prolonged laterally but prolongation never extending to antenna; antenna reaching far beyond caudal margin of wing and to 6th abdominal segment; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle situated in normal position; prospiracular slit a rather small opening; prothoracic leg ending two-thirds distance to caudal margin of wing, femur

well visible; mesothoracic legs reaching eleven-twelfths length to caudal margin of wing, distal portion meeting on meson; metathoracic leg ending just before tip of antenna and extending to 6th abdominal segment; hindwing hidden under forewing near caudal margin of 3rd abdominal segment; 1st abdominal spiracle half visible, 2nd–3rd spiracles invisible and 8th spiracle vestigial; 2nd–8th and 10th segments with scattered micro spines cephalo-dorsally; cremaster and cremaster seta never present.

Species examined. *P. glaucopis* (Drury, 1773). Yellowish brown, 18 mm.

Neochalcusia Yen and Yang (Fig. 3)

Allied to preceding genus but differs in following points: cephalic end of body slightly protruded; maxilla ending at half distance to caudal margin of wing, lateral extension of proximal part weak; suture between pro- and mesothorax attached to antenna at cephalic point of suture restricting proximal margin of mesothoracic leg; prothoracic legs ending at five-eighths distance to caudal margin of wing, distal portion meeting on meson; antenna and metathoracic leg extending to 7th abdominal segment; hindwing hidden under forewing at cephalic margin of 4th abdominal segment; 3rd abdominal spiracle invisible.

Species examined. *N. remota* (Walker, 1854). Yellowish brown, 17 mm.

Histia Hübner (Fig. 6)

Prolonged fusiform. F1 seta present. Labial palpus concealed; maxilla extending to five-eighths distance to caudal margin of wing, its central part hidden under prothoracic leg, proximal part extending laterally; antenna reaching almost to tip of mesothoracic leg; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle situated on ventro-lateral prolongation of maxilla, nipple-like; prothoracic leg ending at six-elevenths distance to caudal margin of wing, femur well visible; mesothoracic leg extending five-sixths distance to caudal margin of wing; metathoracic leg visible near apex of wing; hindwing extending narrowly between 3rd–4th abdominal segments and visible again along costal margin of forewing; 1st–3rd abdominal spiracles invisible, 8th spiracle vestigial; 1st–9th abdominal segments bearing many micro spines cephalo-dorsally; cremaster and cremaster seta absent.

Species examined. *H. flabellicornis* (Fabricius, 1775). Yellowish white, 21 mm.

Elcysma Butler (Fig. 5)

Cylindrical. F1 seta present. Labial palpus concealed; mandible never protruded; maxilla reaching half distance to caudal margin of wing, proximal part never extending laterally; antenna reaching apex of hindwing situated on 5th abdominal segment; prothorax narrow; suture between pro- and mesothorax attached to antenna at caudal point of suture restricting proximal margin of prothoracic leg; prothoracic spiracle situated in normal position; prothoracic legs reaching two-thirds distance to caudal margin of forewing, meeting on meson at distal portion, femur never closed in upper portion between tibia and maxilla; mesothoracic leg ending slightly before caudal margin of forewing; metathoracic leg visible over most of its length and extending to cephalic margin of 6th abdominal segment; hindwing never hidden under forewing and appearing as a long protruded apex on ventro-meson; 1st and 2nd abdominal spiracles half visible, 8th spiracle rudimentary; 2nd–8th and 10th abdominal segments scattered sparsely with micro spines cephalo-dorsally; cremaster and cremaster seta absent.

Species examined. *E. westwoodii* (Snellen and Vollenhoven, 1863). Yellowish white, 18 mm.

Subfamily Procridinae

Unnamed tribe

Rhagades Warrengren (Fig. 7)

Fusiform. F1 seta present. Labial palpus concealed; maxilla ending at half distance to caudal margin of wing, proximal part extended laterally but prolongation never extending to antenna; antennae reaching just beyond caudal margin of wing, meeting on meson in distal portion; eye-piece small; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle invisible; prothoracic legs extending five-sixths distance to caudal margin of wing, meeting on meson in distal half, femur appearing large; mesothoracic leg reaching close to caudal margin of wing, distal portion hidden under antenna; metathoracic leg well visible, reaching caudal margin of 5th abdominal segment; hindwing hidden under forewing at caudal margin of 2nd abdominal segment; 2nd abdominal spiracle invisible, 8th spiracle vestigial; 1st–9th abdominal segments with band of micro spines cephalo-dorsally; cremaster absent but bearing numerous ciliary cremaster setae.

Species examined. *R. pruni* ([Schiffermüller and Denis], 1775). Milky white, 10 mm.

Pseudoinope Efetov and Tarmann (Fig. 23)

♂. Fusiform. Cl1 and Cl2 setae present. Labial palpus concealed; mandible never protruded; maxilla reaching far beyond caudal margin of wing and extending to 8th abdominal segment, intermediate portion hidden under antenna, proximal part extending laterally broader than in *Artona* Walker; antennae reaching one quarter of distance to caudal margin of wing, meeting on meson in distal portion; suture between pro- and mesothorax attaching to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle invisible; prothoracic leg reaching five-eighths the distance to caudal margin of wing, femur widely visible; mesothoracic leg ending far before caudal margin of wing, distal portion hidden under antenna; metathoracic leg extending to 8th abdominal segment; hindwing hidden under forewing on 6th abdominal segment; 2nd abdominal spiracle invisible; 7th and 8th spiracles rudimentary; 3rd–8th abdominal segments possessing a series of many micro spines cephalo-dorsally; cremaster absent but bearing four pairs of hooked setae on 10th segment dorsally.

Species examined. *P. fusca* (Leech, 1889). Pale yellow, 7 mm.

Tribe Procridini

Illiberis Walker (Figs 15–17)

Fusiform. Cl1 and Cl2 setae present. Labial palpus concealed; mandible slightly protruded in the species of the subgenus *Hedina*; maxilla reaching two-thirds distance to caudal margin of wing; proximal part extending laterally in the species of the subgenus *Primilliberis* but never extending in *Hedina*; antenna reaching or almost reaching caudal margin of wing; prothorax narrow; suture between pro- and mesothorax attaching to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle visible on the ventro-lateral prolongation of maxilla or invisible; prothoracic legs extending three-fifths

the distance to caudal margin of wing, meeting or not on meson in distal portion, femur widely visible; mesothoracic leg ending far before caudal margin of wing, but distal portion hidden under antenna; metathoracic leg extending to 6th or 7th abdominal segment; hindwing hidden under forewing on 3rd abdominal segment; 2nd abdominal spiracle invisible, 8th spiracle vestigial; 2nd–9th abdominal segments with a series of micro spines cephalo-dorsally; cremaster absent but four pairs of hooked cremaster setae present.

Key to the species

1. Maxilla reaching far beyond tip of antenna, proximal portion never extending laterally; mandible slightly protruded; prothoracic spiracle visible, verruca; metathoracic leg reaching 7th abdominal segment; forewing extending to 6th abdominal segment; hindwing hidden under forewing at spiracular level of 3rd abdominal segment; a series of micro spines on abdominal segments cephalo-dorsum larger than the following subgenus; brownish yellow; 10 mm **Subgenus *Hedina*: *tenuis*** (Butler, 1877) (Fig. 17)
 - Maxilla not reaching tip of antenna, proximal portion extending laterally; mandible never protruded; metathoracic leg reaching 6th abdominal segment; forewing extending to 4th abdominal segment; a series of micro spines on abdominal segments cephalo-dorsally smaller than in the preceding subgenus **Subgenus *Primilliberis*: 2**
2. Antenna ending well before caudal margin of wing; prothoracic spiracle visible and protruded; hindwing hidden under forewing at cephalic margin of 3rd abdominal segment; brownish yellow; 10 mm *pruni* Dyar, 1905 (Fig. 15)
 - Antenna reaching caudal margin of wing; prothoracic spiracle invisible; hindwing hidden under forewing at caudal margin of 2nd abdominal segment; brownish yellow; 11 mm *rotundata* Jordan, 1907 (Fig. 16)

Tribe Artonini

Clelea Walker (Fig. 22)

Fusiform but slightly prolonged. Cl1 and Cl2 setae present. Labial palpus concealed; mandible distinct; maxilla reaching caudal margin of wing in ♀ or slightly less far in ♂, proximal margin extending laterally slenderer than that of *Illiberis* Walker; antenna ending at tip of mesothoracic leg in ♀ or far beyond in ♂; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle invisible; prothoracic leg extending half the length to caudal margin of wing, femur widely visible, with some micro setae at the base of femur; mesothoracic leg reaching to slightly short of caudal margin of wing, distal portion hidden under antenna; metathoracic leg extending to caudal margin of wing in ♀ or beyond in ♂; forewing angular at shoulder; hindwing hidden under forewing at caudal margin of 3rd abdominal segment; 1st abdominal spiracle invisible; 8th spiracle vestigial; 2nd–8th abdominal segments bearing a series of micro spines cephalo-dorsally; cremaster absent but bearing four pairs of straight setae on 10th segment dorsally.

Pupating in aggregation (Hayashi, 2003).

Species examined. *C. esakii* Inoue, 1958. Pale yellow, 8 mm.

***Balataea* Walker (Figs 18–21)**

Fusiform but slightly prolonged. Cl1 and Cl2 setae present. Labial palpus concealed; mandible distinct; maxilla reaching to or far beyond caudal margin of wing, proximal part extending slenderly laterally; antenna ending at or well before tip of maxilla; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of pro- or mesothoracic leg; prothoracic spiracle invisible; prothoracic leg extending two-thirds distance to caudal margin of wing, femur widely visible; mesothoracic leg reaching slightly beyond caudal margin of wing; distal portion of metathoracic leg visible over a long distance; forewing angular at shoulder; hindwing hidden under forewing on 2nd or 3rd abdominal segment; 1st and 2nd abdominal spiracles visible or invisible, 8th and/or 7th spiracles vestigial; 2nd–8th abdominal segments bearing many micro spines cephalo-dorsally; cremaster absent but bearing five pairs of hooked setae on 10th segment dorsally.

Key to the species

1. Antenna reaching caudal margin of wing in ♀ or short of it in ♂; maxilla ending at caudal margin of wing; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of mesothoracic leg; mesothoracic legs never hidden under antenna, distal portion meeting on meson; metathoracic leg extending to 7th abdominal segment in both sexes; hindwing hidden under forewing at cephalic margin of 3rd abdominal segment; 1st and 2nd abdominal spiracles invisible, 8th spiracle vestigial; 3rd–7th abdominal segments bearing a band of micro spines cephalo-dorsally; pale brown, 11 mm
..... **Subgenus A: *martini*** (Efetov, 1997) (Fig. 18)
- Antenna reaching caudal margin of wing in ♀ or beyond in ♂; maxilla ending far beyond caudal margin of wing and reaching 6th abdominal segment in ♀ but 7th segment in ♂; suture between pro- and mesothorax attached to antenna at a point of suture restricting proximal margin of prothoracic leg; mesothoracic legs never meeting on meson; metathoracic leg extending to 7th abdominal segment in ♀ but 8th or 10th segments in ♂; hindwing hidden under forewing on 2nd abdominal segment; 1st abdominal spiracle visible; 7th–8th spiracles vestigial; 2nd–8th abdominal segments bearing a series of micro spines cephalo-dorsally
..... **Subgenus *Balataea*: 2**
2. Mesothoracic leg extending to 7th abdominal segment in ♂ but to 5th segment in ♀; metathoracic leg reaching 8th abdominal segment in ♂ but 7th segment in ♀; 2nd abdominal spiracle concealed; 8th abdominal spiracle sharply protruded in ♂; 2nd–7th abdominal segments bearing a series of small spines cephalo-dorsally; pale brown, 11 mm.....*gracilis* (Walker, 1865) (Fig. 19)
- Mesothoracic leg extending to 6th abdominal segment in ♂ but to 5th segment in ♀; metathoracic leg reaching 10th abdominal segment in ♂ but 8th segment in ♀; 2nd abdominal spiracle visible; 8th spiracle swollen in ♂; 2nd–8th abdominal segments bearing a series of small spines cephalo-dorsally; pale yellow; 10 mm
..... *octomaculata* (Bremer, 1861) (Figs 20–21)

Epipyropidae

The pupa of *Epipomponia nawai* Dyar has been also described by Azuma (1939).

Two genera of this family are known from Japan (Kato, 1937, 1940) but these pupae are closely allied to each other and the features of the subfamily and genus were not described

in the references.

General character of epipyropid pupa

The pupa is incomplete, and shows slight but distinct sexual dimorphism. Adfrontal and coronal sutures present; labrum distinct; labial palpus roundish, more or less extended laterally at base in *hagoromo*; maxilla concealed; antenna wide, in ♀ shorter than in ♂, reaching caudal margin of 1st abdominal segment in ♂ and caudal margin of mesothorax in ♀; eye-piece indistinguishable; prothorax small; mesothorax large, swollen dorsally especially in ♂ of *hagoromo*; metathorax small; suture between pro- and mesothorax attaching to antenna at a point of suture restricting proximal margin of mesothoracic leg; prothoracic spiracle concealed; prothoracic legs extending five-sevenths distance to caudal margin of wing, meeting on meson in distal portion; mentum well visible on pro- and mesothorax ventromeson; mesothoracic legs extending slightly beyond caudal margin of wing in *nawai* but just short of it in *hagoromo*, meeting on meson in distal portion; metathoracic leg invisible in *nawai*; forewing expanded to 6th abdominal segment in ♂ but to 4th segment in ♀; hindwing hidden under forewing at caudal margin of 5th abdominal segment in ♂ and of 3rd segment in ♀; freely movable in 3rd–7th (♂) or 3rd–6th (♀) abdominal segments; 3rd–8th abdominal segments dorsad in ♂ and 3rd–7th segments dorsad in ♀ scattered with band of micro spines; abdominal spiracle visible in 5th–8th segments in ♂ and in 3rd–8th segments in ♀ but 8th one vestigial; caudal end of body with slightly protruded bifid processes.

Pupating in a white fluffy cocoon on wood trunk or on undergrowth grass.

Inoue (1982) suggested that *Epipomponia nawai* Dyar might possibly be parthenogenetic. This was demonstrated by Ishii (1998) in the laboratory; no cocoons produced males; the emerged female soon laid about 700 eggs on average, and the eggs hatched in the next spring after hibernation. But, since the author has examined a male pupa, this species is probable very rarely gamogenetic.

Key to the genera

1. Labial palpus never extending laterally at base; mesothorax never so swollen dorsally; mesothoracic leg extended beyond caudal margin of wing; metathoracic leg invisible; forewing expanded to 6th abdominal segment; bifid protrusion of distal end of body larger; yellowish brown, 8 mm
..... *Epipomponia nawai* Dyar, 1904 (Fig. 13, ♂, Fig. 14, ♀)
- Labial palpus slightly extending laterally at base; mesothorax heavily swollen dorsally; mesothoracic leg extending to slightly short of caudal margin of wing; metathoracic leg visible; forewing expanded to 7th abdominal segment; bifid protrusion of distal end of body small; yellowish brown, 4 mm
..... *Epiricania hagoromo* Kato, 1939 (Fig. 11, ♂, Fig. 12, ♀)

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摘 要

日本産マダラガ科およびセミヤドリガ科の蛹(鱗翅目)(中村正直)

日本に産するマダラガ科13属とセミヤドリガ科2属の蛹の分類を行った。その結果、マダラガ科は4亜科とし、そのうちのProcrinaeをProcriniとArtoniniに分割、更に蛹の形質から*Rhagades*および*Pseudoinope*を暫定的にこれらとは別の族として取り扱った。

わが国に産する2種のセミヤドリガは夫々別亜科のものとして取り扱われているが、蛹の形態上は属を分ける程の違いも認めることは出来なかった。セミヤドリガ*Epipomponia nawai* Dyarは従来単性生殖をするのではないかと考えられており、実験室ではこれが確かめられているが、筆者は偶々この種の雄の1蛹を検することが出来たので、本種は野外でも例外的に両性生殖をすることがあり得るのではないかと考える。

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